

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554**

In the Matter of

Request for Waiver of 5.9 GHz Band Rules to
Permit Initial Deployments of Cellular Vehicle-
to-Everything Technology

ET Docket No. 19-138

REQUEST FOR WAIVER

The automakers, state Departments of Transportation, and equipment manufacturers named below respectfully request that the Commission waive its current rules applicable to the 5.895-5.925 GHz band (“Upper 5.9 GHz Band”) to permit them to collectively deploy and facilitate deployment of Cellular Vehicle-to-Everything (“C-V2X”) technology immediately, so that consumers and travelers may begin to benefit from this state-of-the-art roadway and vehicle safety technology as soon as possible, before final Commission action on the *Further Notice* in this docket.¹ This Request for Waiver is filed by Audi of America, Inc.; Ford Motor Company; Jaguar Land Rover; the Utah Department of Transportation; the Virginia Department of Transportation; AAEON Technology Inc.; Advantech Co., Ltd.; Applied Information, Inc.; Cohda Wireless Pty Ltd; Commsignia, Inc.; Danlaw Inc.; HARMAN International Industries, Inc.; Kapsch TrafficCom USA Inc.; and Panasonic Corporation of North America (collectively referred to herein as the “Waiver Parties”). The undersigned Waiver Parties seek a waiver of

¹ This waiver request is filed pursuant to Section 1.925(b)(3) of the Commission’s rules, 47 C.F.R. § 1.925(b)(3), and paragraphs 55-56 and 95 of the *First Report and Order, Further Notice of Proposed Rulemaking, and Order of Proposed Modification* in the above-captioned docket, *Use of the 5.850-5.925 GHz Band*, First Report and Order, Further Notice of Proposed Rulemaking and Order of Proposed Modification, 35 FCC Rcd 13440, 13464-5 ¶¶ 55-56, 95 (2020) (“*Order*” and “*FNPRM*”).

47 C.F.R. § 2.106, NG160 to allow use of the upper frequencies of the 5.9 GHz band for C-V2X operating in the Intelligent Transportation System radio service, conditioned on the technical parameters set forth in Appendix 1. To the extent appropriate or necessary, the Waiver Parties also seek to waive these Part 90 and Part 95 rules (*i.e.*, Sections 90.375, 90.377, 90.379, 95.3159, 95.3163, 95.3167, 95.3189),² and any other rules the Commission views as barriers to the deployment of C-V2X set forth in this Request for Waiver.

As demonstrated below, the underlying purpose of the 5.9 GHz band rules – permitting the widescale deployment of V2X technologies – would not be served by restricting deployments to a technology the Commission has begun to sunset. Given that the Commission concluded in the *Order* that moving forward exclusively with C-V2X in the Upper 5.9 GHz Band is the “best decision for promoting more robust ITS deployment in the 5.9 GHz band in the coming years,” applying the current rules would therefore be contrary to the public interest.³ In contrast, grant of this request would promote the public interest by accelerating C-V2X deployment as intended by the Commission, thereby satisfying the standards for waiver in Section 1.925(b)(3) of the Commission’s rules.⁴

² See 47 C.F.R. §§ 90.375, 90.377, 90.379, 95.3159, 95.3163, 95.3167 & 95.3189.

³ *Order*, 35 FCC Rcd at 13484 ¶ 105.

⁴ On August 6, 2021, at the Commission’s directive, the Wireless Telecommunications Bureau and the Public Safety and Homeland Security Bureau issued a Public Notice providing guidance to applicants seeking waivers. *Wireless Telecommunications Bureau and Public Safety and Homeland Security Bureau Provide Guidance for Waiver Process to Permit Intelligent Transportation System Licensees to Use C-V2X Technology in the 5.895-5.925 GHz Band*, Public Notice, DA 21-962 (Aug. 6, 2021). In that document, the Bureaus announced that waiver requests that do not meet the conditions set forth in the Public Notice “will be evaluated by the same Section 1.925 waiver standard in the general review process afforded to all licensees and applicants.” *Id.* at 2 (footnote omitted).

I. THERE IS AN IMMEDIATE NEED FOR DEPLOYMENT OF C-V2X-BASED INTELLIGENT TRANSPORTATION SERVICES

In the *Order*, the Commission recognized the critical need to promote the “widespread deployment of [Intelligent Transportation System] services to the American automotive public.”⁵ Relying on substantial record evidence, the Commission determined that C-V2X was best suited to the task. In so doing, the Commission noted that the prior ITS standard, Dedicated Short-Range Communications (“DSRC”), had “barely been deployed in the more than 20 years since the FCC adopted that standard”⁶ and that “[f]urther delay will not serve the American public”⁷ Accordingly, citing its belief that “many (if not most) of the few active ITS licensees will want to transition to C-V2X technology as soon as possible,”⁸ the Commission announced that it would use its waiver process to permit C-V2X deployments prior to finalization of its C-V2X rules via the *Further Notice*.

The Commission was prescient: in the wake of the *Order*, the Waiver Parties are ready, willing, and able to deploy or facilitate deployment of C-V2X technology *now*. The Waiver Parties’ deployment and deployment-related plans are set forth below.

- **Audi of America, Inc. (“Audi of America”)**: In collaboration with a range of public and private partners, Audi of America has supported successful initial deployments of C-V2X technology in northern Virginia and Alpharetta, Georgia, pursuant to experimental authority. These pilot deployments have helped clarify the benefits C-V2X connectivity will provide motorists when approaching vulnerable road users and have assisted Audi’s partners in optimizing safety applications. Audi of America’s parent company, AUDI AG, announced in August it would integrate 5G mobile communication and C-V2X technology into production vehicles for China, with launches in other markets expected to follow soon. On the heels of this progress, Audi of America requests that the FCC grant this waiver request so it can expedite

⁵ *Order*, 35 FCC Rcd at 13456 ¶ 36.

⁶ *Id.* at 13441-2 ¶ 3.

⁷ *Id.* at 13484 ¶ 106.

⁸ *Id.* at 13479 ¶ 95.

other Vulnerable Road User-oriented safety deployments in the year ahead and begin introducing C-V2X into its vehicle fleet in the United States as soon as possible.

- **Ford Motor Company (“Ford”)**: America’s oldest automaker wants to deploy C-V2X in all of its new vehicle models, with initial deployments as soon as practicable.⁹
- **Jaguar Land Rover (“JLR”)**: JLR has long been an active proponent of C-V2X and requests that the Commission grant this waiver request so it can begin introducing C-V2X into its vehicle fleet as soon as possible.
- **Utah Department of Transportation (“UDOT”)**: UDOT is deploying over a thousand C-V2X roadside units (“RSUs”) and onboard units (“OBUs”) within the next two years, with initial deployments beginning next month. UDOT seeks authority to deploy these C-V2X RSUs pursuant to its ITS license call sign WQCE200, which authorizes UDOT to operate ITS RSUs throughout Utah.
- **Virginia Department of Transportation (“VDOT”)**: VDOT holds FCC license WQCU200 allowing it to provide Intelligent Transportation Services in the 5.9 GHz band. VDOT intends to deploy C-V2X-based services under this license once it has FCC authorization to do so. In the next two to three years, VDOT plans to deploy C-V2X RSUs for the following purposes, including but not limited to: connected work zones, traffic signal enhancement, and traffic flow applications, such as speed harmonization. VDOT plans to deploy C-V2X RSUs in multiple construction districts and along major corridors, such as I-95, I-81, I-66, and I-64.
- **Applied Information, Inc.**: Applied Information has partnered with various state and municipal transportation authorities to deploy C-V2X RSUs and OBUs in Alpharetta, GA; Arlington, TX; Honolulu, HI; Rochester, MN; Worcester, MA, and Springboro, OH under experimental authority. The waiver requested herein will allow Applied Information to complete development of existing and new prototype devices into operational equipment that can meet the Commission’s equipment authorization requirements.
- **Other Equipment Manufacturers**: The other equipment manufacturer signatories to this Waiver Request likewise wish to supply the undersigned automakers and state DOTs with OBUs and RSUs if the Waiver Request is granted.

The foregoing statements demonstrate that the Waiver Parties share a common interest, *i.e.*, an urgency to quickly deliver C-V2X safety services to American travelers and a

⁹ Don Butler, *How “Talking” and “Listening” Vehicles Could Make Roads Safer, Cities Better*, City of Tomorrow (Jan. 7, 2019), <https://medium.com/cityoftomorrow/how-talking-and-listening-vehicles-could-make-roads-safer-cities-better-f215c68f376f>.

commitment to continually advance C-V2X safety capabilities. The Waiver Parties are precisely the types of entities to whom the Commission should grant waivers: stakeholders who are prepared to bring C-V2X to market immediately but cannot do so absent a waiver that permits such deployment pending adoption of final C-V2X rules.

The Waiver Parties therefore ask that the Commission waive its rules to the extent necessary to allow each of the state DOTs identified here to deploy C-V2X throughout its state, including in RSUs and OBUs; to allow each of the identified automakers to deploy C-V2X-based OBUs in all of its cars to be sold in the U.S.; and to allow the identified equipment manufacturers to obtain the necessary equipment certifications for their C-V2X equipment.¹⁰ As confirmed below, the requested waiver satisfies the waiver criteria in Section 1.925(b)(3) and should be granted expeditiously.

II. THERE IS GOOD CAUSE FOR THE COMMISSION TO GRANT THIS WAIVER REQUEST UNDER SECTION 1.925(B)(3)

Under Section 1.925(b)(3)(i), the Commission may grant a waiver request if it is shown that “the underlying purpose of the rule(s) would not be served or would be frustrated by application to the instant case, and that a grant of the requested waiver would be in the public interest,” or if “in view of unique or unusual factual circumstances of the instant case, application of the rule(s) would be inequitable, unduly burdensome or contrary to the public interest, or the applicant has no reasonable alternative.” The waiver requested here easily meets

¹⁰ The Commission may accomplish this by waiving 47 C.F.R. § 2.106, NG160 (“In the 5850–5925 MHz band, the use of the non-Federal government mobile service is limited to Dedicated Short Range Communications operating in the Intelligent Transportation System radio service”), conditioned on the technical parameters set forth in Appendix 1. Alternatively, if the Commission concludes it to be more appropriate to waive specific Part 90 and Part 95 rules, it may waive Sections 90.375, 90.377, 90.379, 95.3159, 95.3163, 95.3167, 95.3189, and any other rules the Commission views as barriers to the deployment of C-V2X as described in this Request for Waiver. 47 C.F.R. §§ 90.375, 90.377, 90.379, 95.3159, 95.3163, 95.3167, 95.3189.

this standard – the safety-related purposes of the rules applicable to the Upper 5.9 GHz band would not be served, and in fact would be frustrated, by continuing to apply those rules to the circumstances described here. Applying them would be contrary to the public interest, whereas grant of the waiver would promote the public interest for the reasons identified in the *Order*.

First, the Commission determined just last year that the deployment of C-V2X technology “best serves the American public,” since it advances vehicular safety and promotes interoperability.¹¹ Further, as noted above, the Commission adopted C-V2X to permit the deployment of ITS services that have been unavailable due to the lack of widespread deployment of DSRC.¹² Consistent with this objective, the Commission expressly stated its intent to permit via waiver the deployment of C-V2X technology while it considers final C-V2X rules pursuant to the *Further Notice*.¹³ Grant of the waiver requested here would therefore serve the dual purposes of the *Order*, in that it (1) would enable rapid deployment of the Commission’s chosen technology, and (2) would do so as soon as possible, as the Commission intended when it expressed its intention in the *Order* to use waivers to permit C-V2X deployment during the transition from DSRC to C-V2X. Application of the current rules that permit only the deployment of DSRC technology, by contrast, would be contrary to the public interest, delaying implementation of safety enhancing C-V2X-based Intelligent Transportation Systems.

¹¹ *Order* at 13484 ¶ 106; *see also id.* at 13443 ¶ 8 (“C-V2X-based technology has gained momentum as a means of providing transportation and vehicle safety-related communications. As envisioned, C-V2X would be part of a connected vehicle ecosystem that provides direct communications between vehicles, between vehicles and infrastructure, between vehicles and other road users, and between vehicles and cellular communications providers’ mobile broadband networks.”) (footnotes omitted).

¹² *See, e.g., id.* at 13458 ¶ 41 (“Our plan to introduce C-V2X in the band, . . . , should facilitate economies of scale in the production and deployment of equipment and, ultimately, provision of the core safety functions originally contemplated for the band.”).

¹³ *Order* at 13479 ¶ 95.

Second, the Waiver Parties seek FCC authority to operate C-V2X equipment under the technical parameters detailed in Appendix 1. These parameters are consistent with current FCC technical rules in Part 90 and Part 95 for DSRC-based technologies for both transmit power and out-of-band emissions limits.¹⁴ Operations consistent with these limits will ensure C-V2X does not cause harmful interference to other licensed services in the 5895-5925 MHz C-V2X band. Moreover, as a general proposition in any event, operation of C-V2X RSUs under the terms of this waiver request is unlikely to cause interference to DSRC operations because the undersigned state Departments of Transportation are, as evidenced here, the same entities that would have deployed DSRC RSUs and thus are best positioned to ensure that C-V2X RSUs do not interfere with any remaining DSRC operations. And, C-V2X OBU waivers are unlikely to result in interference to DSRC operations given the limited DSRC deployments, DSRC technology's use of channels in the lower 45 MHz portion of the band that the Commission has reallocated for unlicensed uses, and the itinerant nature of C-V2X OBU operations.

Lastly, the Waiver Parties have no reasonable alternative – they cannot obtain the relief requested herein to deploy C-V2X technology now except through the Commission's waiver process. And without a grant of the requested waiver, the public interest benefits of the Waiver Parties' accelerated C-V2X deployments will be lost. Again, this is justification for positive and immediate Commission action on this submission.

¹⁴ To be clear, the Waiver Parties propose these technical parameters solely for the purpose of this Request for Waiver and to expedite the Commission's approval of C-V2X operations in the upper 20 MHz of the C-V2X band. The Waiver Parties encourage the Commission to adopt the rules proposed by the 5G Automotive Association in its June 2, 2021, Comments in this docket to permit C-V2X deployments in the full 30 MHz band. *See* Comments of 5G Automotive Association, ET Docket No. 19-138, Exhibit A (filed June 2, 2021).

III. CONCLUSION

In sum, the requested waiver advances the objectives of the *Order* and otherwise satisfies the criteria in Section 1.925(b)(3). The Waiver Parties therefore urge the Commission to expeditiously issue the requested waivers consistent with the showing set forth in this Request for Waiver.

Respectfully submitted,

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APPENDIX 1

C-V2X Technical Parameters for FCC Waiver Request

Introduction

The Waiver Parties seek FCC authority to operate C-V2X equipment pursuant to the technical parameters below, which conform to current FCC Part 90 and Part 95 technical rules for DSRC-based technologies, including transmit power and out-of-band emission limits, except for the FCC rules expressly requiring use of DSRC-based technologies. Accordingly, C-V2X equipment operating under these parameters will pose no greater risk of interference to other services in the 5895-5925 MHz band than DSRC equipment operating in compliance with current FCC rules.

C-V2X equipment authorized pursuant to the requested waiver parameters will operate in the 5905-5925 MHz band using a 20 MHz channel. The transmit power for C-V2X OBUs would not exceed 33 dBm EIRP. OBUs are expected to use 20 dBm (*i.e.*, 100 mW) conducted power measured at the antenna input. These limits conform with FCC Rule Section 95.3189, “OBU technical standard,”¹⁵ which requires DSRC OBUs to comply with the technical parameters in IEEE 802.11p-2010. Section I.2.2, “Transmit power levels” and Tables I.4 and I.5a in the 802.11p-2010 standard permit a maximum transmit power level of 44.8 dBm EIRP for government vehicles and 33 dBm for non-government vehicles; conducted power may be up to 760 mW measured at the antenna input.

The transmit power level for C-V2X RSUs also would not exceed 33 dBm EIRP, which is less than maximum average power permitted in the 5905-5925 MHz frequency range under FCC Rule Section 90.377, “Frequencies available; maximum EIRP and antenna height, and priority communications.”¹⁶ This limit is consistent with FCC Rule Section 90.379, “Technical standards for Roadside Units,”¹⁷ which require DSRC RSUs to comply with the technical parameters in IEEE 802.11p-2010. IEEE 802.11p-2010 Section I.2.2, “Transmit power levels” and Table I.4 permit a maximum transmit power level of 44.8 dBm EIRP, which is 11.8 dBm higher than the power level requested in this waiver application. In addition, C-V2X RSU installations would comply with Table Note 1 in Rule Section 90.377 that restricts the height of RSU installations, as presented in the attachment. The OOB limits for C-V2X OBUs and RSUs presented in the attachment are consistent with the 802.11p standard as well.

¹⁵ See 47 C.F.R. § 95.3189.

¹⁶ See 47 C.F.R. § 90.377. FCC Rule Section 90.377 permits up to 40 dBm EIRP in 5915-5925 MHz and 23 dBm EIRP in 5905-5915 MHz. The total power permitted across the 20 MHz channel thus is 10.2 Watts, which is significantly greater than the 2 Watts (*i.e.*, 33 dBm EIRP) transmit power level sought in this waiver request.

¹⁷ See 47 C.F.R. § 90.379.

C-V2X OBU and RSU Operations under FCC Waiver

- **Channelization:**

Frequency Range	Channel Bandwidth (MHz)
5905 - 5925 MHz	20 MHz

- **Transmit power limits:**

- OBU

- 33 dBm EIRP
 - OBUs may include OEM-installed OBUs, public safety OBUs and aftermarket devices including portable devices

- RSU

- 33 dBm EIRP
 - Antenna height shall not exceed 8 meters above the roadway bed surface. An RSU may employ an antenna with a height exceeding 8 meters but not exceeding 15 meters provided the EIRP specified above is reduced by a factor of $20 \log(Ht/8)$ in dB where Ht is the height of the radiation center of the antenna in meters above the roadway bed surface. The EIRP is measured as the maximum EIRP toward the horizon or horizontal, whichever is greater, of the gain associated with the main or center of the transmission beam. The RSU antenna height shall not exceed 15 meters above the roadway bed surface.

- **Out-of-band emission (“OOBE”) limits:**

- An OBU or RSU operating in the above 20 MHz channel shall comply with the OOBE limits for C-V2X shown below. Transmit power spectral density (PSD) measurements shall be made using a 100 kHz resolution bandwidth and a 30 kHz video bandwidth.

Frequency offset (MHz from Channel edge)	OOBE PSD offset relative to 33 dBm/20 MHz (or 10 dBm/100 MHz)	OOBE PSD for C-V2X transmissions (dBm/100 kHz)
0.0	-26.0	-16.0
1.0	-32.0	-22.0
10.0	-40.0	-30.0
20.0	-50.0	-40.0

Note 1: The frequency offsets match those required for a 20 MHz 802.11p channel and the OOB PSD offsets in the middle column match those required for DSRC.

Note 2: Since C-V2X transmission bandwidth and in-band PSD are adaptive, it is more prudent to apply an absolute mask for C-V2X OOB PSD as shown in the rightmost column in lieu of the relative mask used by DSRC.

- OOB Measurements will be conducted and with reference to allowed EIRP (33 dBm). Maximum allowable peak antenna gain = minimum ((allowed EIRP-certified transmit power), minimum margin to spectral mask) + cable loss.